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AUTHOR Miller, Ronald C.; And Others
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ABSTRACT

The Chapter 1/P.S.E.N. Remedial Reading and Mathematics Program of the New York City Board of Education Division of Special Education was designed to provide supplementary instruction to eligible English-speaking and limited English-proficient students in self-contained special education classes. A secondary goal was to provide orientation and inservice training to special education teachers. The remediation consisted of individualized diagnostic-prescriptive instruction. Reading instruction was based on a holistic, meaning-centered approach; mathematics instruction emphasized word problems and practical skills. Evaluation of the program indicated that: (1) the program was adequately implemented; (2) program staff and special education teachers rated their preservice orientation and inservice training favorably; (3) 59.9 percent of the eligible English-speaking students met the achievement objective for reading in English; (4) 54.5 percent of the limited English-proficient students mastered at least two new skills and 34.1 percent mastered at least five skills in their reading instruction in Spanish; and (5) eligible students met and exceeded the program objectives in math. Recommendations for program modifications are offered. (JDD)

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FINAL EVALUATION REPORT

May, 1988

Judith S. Torres, Senior Manager

CHAPTER 1/P.S.E.N.
REMEDIAL READING
AND MATHEMATICS
PROGRAM 1986-87

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CHAPTER 1/P.S.E.N. REMEDIAL
READING AND MATH
1986-87

- ° The 1986-87 Chapter 1 program was satisfactorily implemented. Teachers and administrators overwhelmingly approved of the services that were provided.
- ° Eligible English-speaking public and nonpublic school students did not meet the program objective in reading. Nevertheless, program students showed larger gains in reading performance this year than last year.
- ° Limited English-proficient (LEP) students met one part of the dual-criterion program objective in reading.
- ° Eligible students met and exceeded the program objectives in math.

The Division of Special Education Chapter 1/P.S.E.N. Remedial Reading and Mathematics Program was designed to provide remedial instruction in reading and/or math to eligible students in self-contained special education classes in public and nonpublic schools that supplemented their regular instruction. A secondary goal was to provide pre- and inservice training to special education teachers. The program served a total of 4,910 students. Four thousand three hundred and fifteen received instruction in reading; 44 of these received reading instruction in Spanish. Another 416 received instruction in both reading and math, and 179 received only math instruction.

To measure academic progress, students received remedial instruction in reading were pre- and posttested with the Metropolitan Achievement Test (M.A.T.). LEP students participated in the Leamos Spanish Development Reading Program (Leamos) which assessed achievement on an ongoing basis. In mathematics, the Individualized Criterion Referenced Test (I.C.R.T.) in math provided achievement data, also on an ongoing basis.

The Office of Educational Assessment (O.E.A.) conducted an evaluation of program implementation and analyzed achievement data reported by the program. The evaluation of program implementation consisted of observation of the program at representative sites, as well as interviews with program staff; staff also filled in staff-development assessment forms. Analysis of these data indicated that the program was adequately implemented. The remediation consisted of individualized diagnostic-prescriptive instruction. Reading instruction was based on a holistic, meaning-centered approach; mathematics instruction emphasized word problems and practical skills. Consultants observed a holistic approach to reading instruction at 90 percent of the sites visited. For students receiving

instruction in both reading and mathematics, field consultants observed the integration of reading and math instruction through the use of word problems and vocabulary study.

Program staff and special education teachers received pre-service orientation in the fall and inservice staff development during monthly workshops held in each region, and on-site consultations with program staff. They rated their orientation and inservice training favorably. Because of a cutback in funding in 1986-87, substantially fewer special education classroom teachers reported receiving inservice training than in 1985-86. For future cycles, teachers requested more training in the use of new materials, the application of innovative instructional techniques, and the utilization of the word processor as a teaching aid. They also requested more on-site workshops and more individualized training.

The student achievement objective for reading in English was that 75 percent of the students would demonstrate at least a one-point normal curve equivalent (N.C.E.) gain in reading comprehension from pretest to posttest on the Metropolitan Achievement Test (M.A.T.). Of the 3,255 students for whom achievement data were complete, 59.9 percent attained this goal. The average gain was 3.9 points (S.D.=12.2). Although this was an improvement over the previous year's performance, the objective was not attained. Excluding the Primary 1 and elementary test levels, students at Primary 2, Intermediate, and Advanced levels did meet the objective. Students at the Primary 1 level showed a statistically significant mean N.C.E. loss on pre- and posttest scores on the M.A.T., suggesting the M.A.T. was not sufficiently sensitive in measuring the performance of lower-functioning students.

A total of 44 students in bilingual classes were taught reading in Spanish. The program objectives were that 80 percent of these students would master at least two new skills per 20 sessions attended, and that 30 percent would master at least five new skills per 20 sessions attended. Of the total number of students, only 54.5 percent mastered at least two skills, while 34.1 percent mastered at least five skills. Thus, the objective was only partially met.

The program objectives for math were that 80 percent of the students would master new math skills at the rate of two per 20 sessions attended, and 30 percent would master five or more new math skills per 20 sessions attended. Both objectives were met in that 98 percent mastered two skills per 20 sessions and 56 percent mastered at least five skills per 20 sessions attended.

Recommendations for the next program cycle are:

- Offer to classroom teachers (i.e., non-Chapter 1) more

in-depth discussion of effective instructional techniques, innovative materials, and the utilization of the word processor as a teaching aid.

- ° Replace the M.A.T. in reading with an individualized criterion referenced test, if possible, for lower-functioning students in reading, i.e., those now categorized at the Primary 1 test level.

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I. INTRODUCTION

This report documents the Office of Educational Assessment's (O.E.A.'s) evaluation of the 1986-87 Chapter 1/P.S.E.N. Remedial Reading and Mathematics Program. Administered by the Division of Special Education (D.S.E.), the program was designed to provide supplementary reading and mathematics instruction to eligible English-speaking and limited English-proficient (LEP) special education students at 79 public and six nonpublic schools to supplement their regular instruction. A secondary goal was to provide pre- and inservice training to special education teachers.

INSTRUCTIONAL MODEL

Reading instruction utilized a holistic, meaning-centered approach. It consisted of an integrated process embracing the development of listening, speaking, and writing skills, and utilizing students' personal experiences. Math instruction focused on computation, numeration, practical skills, and the integration of reading and math through the use of word problems and the study of relevant vocabulary.

The public school component used a whole-class model of instruction. An entire class either traveled as a unit with its participating classroom teacher to join the Chapter 1 teacher in a program laboratory, or else the program teacher traveled to different special education classrooms. The whole-class model was designed to retain class integrity, facilitate the integration of basic and remedial instruction, and provide training to

classroom teachers.

The six nonpublic schools used an individual or small-group pull-out model in which students received program instruction outside their classrooms for a minimum of 90 minutes per week.

STAFF

The staff for the Chapter 1 program consisted of one program manager, six coordinators, 13 assistant coordinators, and 85 teachers. The program manager coordinated program activities, oversaw budget issues, kept records, served as O.E.A. liaison, presented the program to the Parent Advisory Council, and supervised the program coordinators.

The six coordinators managed the day-to-day operation of the program. Assistant coordinators had responsibility for providing training and assistance to both program and participating classroom teachers. The 85 program teachers were responsible for on-site implementation of the program, including student assessment, program-related instruction, and recordkeeping. A team consisting of a program teacher and a special education classroom teacher provided remedial instruction to supplement the regular curriculum.

PARTICIPATING STUDENTS

The target population consisted of 4,911 eligible students in self-contained special education classes ranging in age from seven to 18 years at 85 community, special, and nonpublic schools. A total of 4,315 students (87.9 percent of the total)

received instruction in reading alone; 44 (one percent) of these received reading instruction in Spanish; 416 (9.5 percent) received instruction in both reading and math, and 179 (4.1 percent) received only math instruction.

Public School Population Receiving Reading Instruction in English

The largest number of program participants (4,131) received reading instruction in English in 79 public schools distributed throughout the five boroughs. Forty-five percent attended elementary schools, 54.2 percent attended intermediate or junior high schools, and 0.8 percent attended high schools. Their ages ranged from seven to 18 years.

LEP Public School Population

Forty-four LEP students received only reading instruction in Spanish at two sites, one in Manhattan and one in the Bronx. All students attended elementary schools. Their ages ranged from eight to 13 years.

Nonpublic School Population

Participating nonpublic school students received reading instruction only through the D.S.E. Office of Citywide Services.* A total of 140 students were served at six non-public schools.

*These are centrally-operated programs serving severely handicapped students whose numbers are small.

REPORT FORMAT

This report is organized as follows: Chapter II describes the program methodology; Chapter III presents the findings focusing on pupil achievement and program implementation; Chapter IV offers conclusions and recommendations based upon the results of the evaluation.

II. EVALUATION METHODOLOGY

EVALUATION QUESTIONS

The evaluation sought to answer questions in the areas of program implementation and student achievement. Evaluation questions included the following.

Implementation Questions

- ° What was the level of program implementation?
- ° What was the quality of program implementation?
- ° Did program teachers use the holistic approach to teach reading?
- ° Did program teachers stress life skills in their math instruction?
- ° What changes have program personnel instituted in the present program cycle?

Outcome Questions

- ° What was the average normal curve equivalent gain achieved by students?
- ° What facilitated the program's effectiveness?
- ° What, if anything, detracted from the program's effectiveness?

EVALUATION PROCEDURES

Sample

To assess program implementation, O.E.A. field consultants observed instruction, and interviewed program and school staff at 15 program sites (18 percent). O.E.A. selected the sample sites according to region, district, school level, program service categories and program component.

Consultants observed 35 class periods and interviewed 15 program teachers (18 percent), 86 special education classroom teachers, 12 program coordinators and assistant coordinators (63 percent), and 26 school-level administrators (principals, assistant principals, and special education site supervisors).

A total of 4,271 English-speaking public and non-public school students received reading instruction. There were 3,255 English-speaking public and non-public school students for whom reading achievement data were complete (76.2 percent of the total). Data were missing from late admits, students attending fewer than 20 days, and those dropping out early. Instruction in mathematics was given to 596 students. Complete achievement data were available for 589. Data were available on all 44 LEP students receiving instruction in reading.

Instrumentation

To assess program outcomes, O.E.A. collected information on student data retrieval forms on which Chapter 1 teachers entered program, student, and achievement information. The Metropolitan Achievement Test (M.A.T.)* measured English-language reading achievement; the Leamos Diagnostic/Prescriptive Tests (Leamos) provided Spanish language reading achievement data.** The Math Individualized Criterion Referenced Test (I.C.R.T.) measured

*Forms JS and KS, 1978 Survey Edition. San Antonio, Texas: The Psychological Corporation.

**Spanish Developmental Reading Task Force, Los Angeles Unified School District (Paul Amidon and Associates), 1976.

achievement in mathematics.*

O.E.A. developed staff development surveys and interview schedules to collect information about training and program implementation and factors which contributed to, or detracted from, the program's success. Consultants administered interview schedules to program teachers, special education classroom teachers, school administrators, program coordinators, assistant coordinators, and documented additional information on classroom observation forms.

Data Collection

Consultants interviewed and observed school and program staff during a four-month period from February to May 1987. O.E.A. distributed data retrieval forms to teachers in September at the beginning of the program and collected them at the end of the program cycle in May.

Data Analysis

O.E.A. calculated the number of skills each student mastered, and computed the proportion of objectives mastered by each student in each curriculum area as measured by the M.A.T., Leamos, and I.C.R.T. For pre- and posttest results, O.E.A. computed the percent of students showing an N.C.E. gain on the M.A.T. O.E.A. used the correlated t-test model to analyze the statistical significance of "normal curve equivalent" (N.C.E.)

*Tulsa, Oklahoma: Educational Progress (Educational Development Corporation), 1980.

gains for the performance of English-proficient students in reading.

To document implementation, O.E.A. tallied responses to interview questions, and observation descriptions. O.E.A. paid particular attention to staff perceptions of factors which either enhanced or inhibited program success.

III. EVALUATION FINDINGS

IMPLEMENTATION

Chapter 1/P.S.E.N. provided supplementary remedial reading and mathematics instruction to eligible students in public and nonpublic schools. Students received instruction from a remediation team consisting of a program teacher and a special education classroom teacher.

Student Instruction

Scheduling of instruction was the same as in previous cycles. Students receiving reading-only services participated in four or five 45-minute sessions per week. Students who received both reading and math instruction participated in three 45-minute sessions per week in each subject. Those students attending nonpublic schools received at least 90 minutes of reading instruction per week.

A summary of sessions scheduled and sessions attended is presented in Table 1. Students receiving both reading and math instruction had the highest attendance rates, followed closely by students receiving reading instruction in Spanish. These students had higher attendance rates than students receiving reading-only instruction in English. The attendance for the English-speaking public school students receiving reading-only instruction (the largest group served) was slightly lower (74.3 percent) than it was in the previous cycle (77.6 percent).

TABLE 1
Chapter 1/P.S.E.N. Sessions Scheduled and Attended

Instructional Content	Number of Students	Mean Number of Sessions Scheduled	Mean Percent of Sessions Attended
<u>Reading Only</u>			
English (public schools)	4,131	91.2	74.3
English (nonpublic schools)	140	44.5	79.9
Spanish (public schools)	44	111.1	82.7
TOTAL	4,315	89.9	74.6
<u>Math</u>			
Reading and Math	416	76.4	82.9
Math Only	179	85.1	81.2
TOTAL	596	80.5	81.9

- ° The greatest number of sessions were scheduled for students receiving reading instruction in Spanish; the fewest for English-speaking non-public school students receiving reading-only instruction.
- ° Attendance was lowest for English-speaking public school students receiving reading-only instruction.

Reading Instruction

O.E.A. consultants observed that the holistic approach to reading instruction was in use at 27 of the 30 sites visited (90 percent). This is equivalent to the previous cycle when approximately 89 percent of the observed sites were employing this technique at the time of observation. Observers noted features of lessons and instructional strategies consistent with the holistic approach, such as discussion of the readings to develop comprehension, preparatory vocabulary work, reading in related content areas, use of learning games and role playing, discussion of current events (via the reading of newspapers and magazines), and students' personal experiences relevant to the reading assignments. Consultants reported the integration of a writing activity with a reading lesson at 19 sites (63 percent). In terms of the percentage of locations observed, this is identical to the previous cycle.

At sites where word processors were available for reading and writing instruction, program teachers reported that students liked using them, especially to write original stories. Teachers and consultants felt computers increased the students' motivation. Sixty-two of the 86 special education classroom teachers surveyed (72 percent) indicated they would like to learn more about utilizing the word processor for writing and reading instruction.

Most program teachers of English-speaking students used the M.A.T. pretest results for instructional planning and grouping,

but reported that it was not accurate for assessing students' abilities at all levels. Several teachers and coordinators pointed out that the M.A.T. may be especially insensitive as an instrument for measuring levels of lower-functioning students, i.e., the test is too difficult for them.

Program teachers delivering reading instruction in Spanish reported that Leamos provided an accurate assessment of their students' abilities and was a useful indicator for instructional planning. This perception differed from last year, when a larger sample of program teachers reported that an instrument more suitable to the holistic approach would be preferable.

Teachers and coordinators frequently reported the following program strengths: two teachers coordinating instruction; the variety and relevance of instructional materials and teaching strategies; greater individualization of instruction; the application of the holistic approach, especially the incorporation of writing, class discussion, and the use of students' own experiences. Coordinators indicated that additional time for cooperative planning between Chapter 1 staff and classroom teachers would be beneficial for future cycles.

Math Instruction

O.E.A. consultants who observed math classes reported that teachers integrated reading with math instruction through the use of word problems and the study of vocabulary. They observed this integration during all class periods. Teachers also emphasized practical skills and used concrete materials in

almost all classes. Consultants observed teachers using a wide variety of math materials, including abstract and representational items as well as concrete manipulative.

Program teachers reported that they used math I.C.R.T. results for instructional planning and grouping. They stated that they were able to identify accurately their students' specific strengths and weaknesses.

Program and school staff specifically praised the opportunity to individualize instruction, the variety of materials, the integration of reading and math, the emphasis on practical skills, and the effective use of concrete manipulative.

Non-instructional Staff Activities

Staff Collaboration. O.E.A. assessed staff collaboration by examining responses to interview questions and by observing classroom lessons. Classroom teachers and Chapter 1 teachers worked together in the classroom, teaching the same lesson to different groups or teaching different lessons to individual students or the class as a whole. Chapter 1 and classroom teachers reported favorably on their cooperation. They reported they had adequate time for coordination and instructional planning.

Staff Development. Program coordinators and teachers, and special education classroom teachers received pre-service orientation in the fall and inservice training during monthly workshops held in each region. Another type of inservice training offered was on-site consultation for classroom teachers

with the coordinating staff.

Fifty-seven of the 86 participating classroom teachers interviewed (66 percent) reported that the pre-service orientation they received was satisfactory. This is slightly fewer than in the previous cycle, when 71 percent reported their orientation was satisfactory. Thirty-three classroom teachers (38 percent of those interviewed) indicated they had received inservice training. Due to the reduction in funds in 1986-87, this is a substantial decrease from 1985-86, when 61 percent of teachers interviewed indicated that they had received inservice training.

The inservice training covered the following topics: roles and responsibilities of program and classroom teachers; methods and materials for teaching reading holistically; specific instructional strategies for LEP students; utilizing assessment data to develop student objectives; using the word processor for writing and reading instruction; new instructional strategies in mathematics; and using new materials.

Coordinators and program teachers rated their inservice training favorably. Of the topics covered, program coordinators were most interested in the workshops that addressed the use of assessment data to develop student objectives. Program teachers were especially interested in new instructional strategies for LEP students. For future cycles, coordinators and assistant coordinators requested more information about less restrictive placement and mainstreaming of Chapter 1 students.

Coordinators and program teachers also requested more training in using the word processor as a learning tool.

Classroom teachers requested, as they had in the previous cycle, that Chapter 1 staff offer more on-site workshops and provide more individualized training. They too were particularly interested in learning more about new instructional techniques in math and for LEP students, using the word processor for writing and reading instruction, and utilizing new materials.

Parent Education and Involvement

Parent workshops were held at all Chapter 1 sites. As before, attendance was variable, but generally low. The parent programs focused on reviewing activities related to Chapter 1 and other reimbursable programs in special education.

OUTCOMES

English Reading Achievement

The program objective for students receiving reading instruction was:

- ° By June 30, 1987, 75 percent of the Chapter 1/P.S.E.N. target population receiving remedial reading instruction will demonstrate a normal curve equivalent (N.C.E.) gain in reading comprehension from pretest to posttest, as measured by the M.A.T. in reading.

For the purpose of determining program success, only those students who attended a minimum of 20 days were included when assessing achievement outcomes. O.E.A. combined M.A.T. reading scores from public and non-public school students in the analysis as there was no differentiation in the program objective.

Achievement data showed that overall, 59.9 percent of the students demonstrated an N.C.E. gain in reading comprehension (fall to spring administration), indicating that the program objective was not attained (see Table 2). This represents an improvement from the previous cycle, when 55.8 percent of students demonstrated an N.C.E. gain.

At all levels except primary 1, more than 50 percent of the students tested demonstrated an N.C.E. gain. Excluding the primary 1 and elementary test levels, the mean gain for the three remaining groups -- primary 2, intermediate, and advanced -- was 73.3 percent which virtually met the 75 percent objective. These data indicate that the reading instruction program met its objective at these test levels.

Within test levels, the mean N.C.E. gain of 3.9 for the entire group was statistically significant and represented a small effect size of .32, which may be considered only slightly educationally meaningful.* (See Table 3).

The Chapter 1 program has produced a statistically significant decrement in mean performance for the past two cycles at the Primary 1 test level (-1.6 N.C.E.s in 1986-87; -2.6 N.C.E.s in 1985-86). This decline in performance and the relatively low outcome for the elementary level (3.9) appear to indicate that the program as measured by the M.A.T. was not

*The effect size, developed by Jacob Cohen, is a ratio of the mean gain to the standard deviation of the gain. Effect size (E.S.) is interpreted to indicate educational meaningfulness. An E.S. of .8 is considered highly meaningful, while one of .2 is considered only slightly meaningful.

TABLE 2

Students' N.C.E. Gains on the M.A.T. in Reading,
by Test Level

Test Level	N	Percent of Students Showing a Gain
Primary 1	766	34.5
Primary 2	743	69.3
Elementary	951	58.8
Intermediate	636	78.6
Advanced	159	71.1
ALL LEVELS	3,255	59.9

- ° Overall, 59.9 percent of the students showed an N.C.E. gain.
- ° Students tested at the Intermediate level had the highest percentage showing an N.C.E. gain.
- ° Students at the Primary 2, Intermediate, and Advanced levels met the program objective.

TABLE 3

Significance and Effect Size of
N.C.E. Gains on the M.A.T. in Reading, by Test Level

Level	Number of Students	<u>Pretest</u>		<u>Posttest</u>		Mean N.C.E. Gain (Loss)	Standard Deviation of Difference	t	Effect Size
		Mean	S.D.	Mean	S.D.				
Primary 1	766	35.4	16.9	33.8	18.1	(-1.6)	14.3	(-3.0*)	(-.11)
Primary 2	743	35.6	13.0	41.7	15.2	6.1	10.9	15.3*	.56
Elementary	951	36.9	13.0	40.7	13.6	3.9	11.0	10.9*	.35
Intermediate	636	36.7	11.6	43.9	12.0	7.3	10.2	18.1*	.71
Advanced	159	39.6	14.1	46.3	16.0	6.7	12.7	6.7*	.53
ALL LEVELS	3,255	36.3	13.9	40.2	15.5	3.9	12.2	18.3*	.32

*p < .05

- Mean differences ranged from a loss of 1.6 N.C.E.s at the Primary 1 level to a gain of 7.3 at the Intermediate level.
- All mean differences were statistically significant.
- N.C.E. gains of students tested at the Primary 2, Intermediate and Advanced levels showed moderate effect sizes, suggesting moderate educational meaningfulness.

effective at the primary 1 and elementary levels. It might be that the skills of those tested at that level were already so low, the program could not have made a measurable difference.

Intermediate and junior high school students demonstrated the highest percentage showing improvement (62.9 and 62.6 percent). (See Table 4.) These students had the largest mean N.C.E. gain (4.3), as well as the most educationally meaningful gain indicated by the effect size. (See Table 5.) High school students had the lowest percentage showing improvement (29.2 percent) and the smallest mean N.C.E. gain (0.7 percent). The large standard deviations of the mean gains suggest that the groups of students tested were very heterogeneous, with some students making large gains and others showing N.C.E. losses.

Reading Results for LEP Students

The program objective for students receiving reading instruction in Spanish was:

- By June 30, 1987, 80 percent of the bilingual Chapter 1/ P.S.E.N. population receiving remedial reading instruction in Spanish will master at least two new skills per 20 sessions attended, and that 30 percent will master at least five new skills per 20 sessions attended as measured by ongoing administration of the Leamos.

For the purpose of determining program success, only those students attending a minimum of 20 days were included in the computation of mastery data.

Data analysis indicated that 54.5 percent of the students (24) mastered at least two skills in 20 sessions. This part of the objective was not met. The second part of the objective,

TABLE 4
Students' N.C.E. Gains on the M.A.T.
in Reading, by School Level

School Level	Total Number of Students	Percent of Students Showing a Gain
Elementary	1,294	56.2
Intermediate	1,084	62.9
Junior High	848	62.6
High School	24	29.2
ALL LEVELS	3,250	59.9

- ° The intermediate school group had the highest percent of students showing an N.C.E. gain.

TABLE 5

Significance and Effect Size of
N.C.E. Gains on the M.A.T. in Reading, by School Level

Level	Number of Students	Pretest		Posttest		Mean N.C.E. Gain	Standard Deviation	t	Effect Size
		Mean	S.D.	Mean	S.D.				
Elementary	1,294	33.4	14.6	36.8	15.7	3.3	13.3	9.2*	.25
Intermediate	1,084	38.7	13.8	43.0	15.6	4.3	11.4	12.5*	.38
Junior High	848	37.3	11.7	41.6	13.9	4.3	11.6	10.7*	.37
High School	24	50.7	10.4	51.4	12.4	0.7	9.1	0.4	.08
ALL LEVELS	3,250	36.3	13.8	40.3	15.5	3.9	12.2	18.2*	.32

*p < .05

- Mean N.C.E. gains ranged from 0.7 at the high school level to 4.3 at the intermediate and junior high school levels.
- All gains were statistically significant except at the high school level; the associated effect sizes were small.
- Students attending intermediate and junior high schools showed the most meaningful N.C.E. gains.
- The large standard deviations of the mean gains suggest that the performance of the student groups tested was very heterogeneous.

however, was met in that 34.1 percent (15) mastered five or more skills per 20 sessions. (See Table 6). These outcomes were the reverse of the previous year's findings. In 1985-86, students met the objective for mastering at least two skills, but did not meet the objective for mastering five or more skills. Overall, mastery was much less substantial in 1986-87 when 48 percent of the students mastered at least 12 skill objectives, compared to 1985-86 when 75 percent mastered the same number of skills. (See Table 7.)

Math Achievement

The objective for students receiving math instructions was:

- ° By June 30, 1987, 80 percent of the students receiving remedial math instruction will master two new math skills per 20 sessions attended and 30 percent will master at least five new skills per 20 sessions attended as measured by ongoing administration of the I.C.R.T.

An analysis of achievement data indicated that both parts of the objective were met. Ninety-eight percent mastered at least two new skill objectives per 20 sessions attended, and 56 percent mastered at least five skill objectives per 20 sessions attended. (See Table 8.) The mean number of skill objectives mastered was 5.8 (S.D. = 5.7) per 20 sessions attended. The distribution was highly skewed, indicating that, overall, students readily mastered the objectives. Over 60 percent of the students mastered 13 or more objectives, and over 80 percent mastered 9 or more. (See Table 9.) The mean number of total skills mastered was 14.7 (S.D. = 6.5). This is a reduction from 1985-86, when the mean number of skills mastered was 26.9.

TABLE 6
Frequency Distribution of Mastery Rates of Leamos Skills

Mastery Rate ^a	Number of Students	Relative Percent	Cumulative Percent
5 or more	15	34.1	34.1
4	5	11.3	45.4
3	3	6.8	52.2
2	1	2.3	54.5
1	19	43.2	97.7
less than 1	1	2.3	100.0
TOTAL	44	100.0	

^aNumber of skills mastered per 20 sessions attended.

- About 55 percent of LEP students tested with Leamos mastered at least two skills per 20 sessions attended. This objective was not met.
- About 34 percent of LEP students mastered at least five skills per 20 sessions attended, meeting the program objective.

TABLE 7

Frequency Distribution of Total
Leamos Skills Mastered
(N = 44)

Number of Objectives Mastered	Number of Students	Relative Percent	Cumulative Percent
21 - 24	11	25.0	25.0
17 - 20	5	11.4	36.4
13 - 16	4	9.0	45.4
9 - 12	1	2.3	47.7
1 - 4	22	50.0	97.7
0	1	2.3	100.0

- ° Twenty-five percent of program students mastered 21-24 objectives.
- ° The largest proportion of the students (50 percent) mastered 1-4 objectives.

TABLE 8
Frequency Distribution of Mastery
Rates of I.C.R.T. Math Skills

Mastery Rate ^a	Number of Students	Relative Percent	Cumulative Percent
5 or more	331	56.2	56.2
4	138	23.4	79.6
3	67	11.4	91.0
2	42	7.1	98.1
1	3	0.5	98.6
less than 1	8	1.4	100.0
TOTAL	589	100.0	

^aNumber of skills mastered per 20 sessions attended.

- ° Over 98 percent of the students mastered at least two new skills per 20 sessions attended.
- ° Over 56 percent mastered at least five new skills per 20 sessions attended.

TABLE 9

Frequency Distribution of Total I.C.R.T. Math Skills Mastered

Number of Objectives Mastered	Students		
	Number	Relative Percent	Cumulative Percent ^a
25 or more	49	8.2	8.2
21 - 24	70	11.7	19.9
17 - 20	153	25.7	45.6
13 - 16	89	14.9	60.5
9 - 12	123	20.6	81.1
5 - 8	71	11.9	93.0
1 - 4	31	5.2	98.2
0	10	1.7	99.9
TOTAL	596	99.9	

^aNumbers do not total 100 percent due to rounding.

- ° About 60 percent of the students mastered 13 or more objectives.
- ° Less than two percent failed to master any new skills.

Math Achievement by Skill Area

The Math I.C.R.T. is divided into the following six skill areas: whole number operations, fractions, geometry, measurement, decimals, and special topics. Whole number operations, fractions, and decimal and percentage sections measure knowledge of mathematical concepts, numeration, arithmetic operations, and problem-solving skills. Measurement skill areas assess competency in length, size, area, and volume. Geometry includes work in spatial concepts, lines, angles, shapes, and solids. Problems in special topics involve money, graphs, tables, time, and Roman numerals.

As in the previous cycle, over half (57.6 percent) of the skills mastered were in the area of whole number operations. Almost 30 percent were in special topics; 10.3 percent in measurement, 4.2 percent in geometry, and no skills at all were mastered in the areas of fractions and decimals.

IV. CONCLUSIONS AND RECOMMENDATIONS

The Division of Special Education's Chapter 1/P.S.E.N. Individualized Reading and Math Services Program provided supplementary remedial reading and math instruction to eligible students in public and nonpublic schools.

The Office of Educational Assessment conducted an evaluation of the program's implementation and outcomes. Major implementation findings included the following: nearly all program teachers (90 percent of those observed) employed a holistic approach to teach reading; teachers integrated reading and math instruction by using word problems and emphasizing practical skills; teachers effectively utilized a wide variety of instructional materials; and program teachers reported that staff development continued to be excellent. Teachers were especially interested in learning more about specific teaching strategies, new materials, and computer-assisted learning.

Analysis of the implementation data indicated that the program was satisfactorily implemented except in training for special education classroom teachers. As a result of a cutback in funding in 1986-87, only 38 percent of classroom teachers interviewed reported receiving inservice training compared to 61 percent in 1985-86. About the same proportion of classroom teachers reported the orientation training they received was satisfactory.

Some program objectives were met while others were not. Of the 3,255 English-speaking public and nonpublic school students

in reading, 60 percent showed an N.C.E. gain as measured by the M.A.T., falling short of the program objective. While test performance at the Primary 1 level was relatively poor, students at Primary 2, Elementary, Intermediate, and Advanced test levels showed N.C.E. gains.

Excluding Primary 1 and elementary, performance gains were moderately educationally meaningful. As in the previous cycle, Primary 1 test level students showed a statistically significant mean N.C.E. loss on pre- to posttest scores on the M.A.T. These findings bring into question: (1) the sensitivity of the M.A.T. for measuring performance, especially of lower-functioning students and (2) the utility of the Chapter 1 program for these types of students. The variability of student N.C.E. gains also suggests that the M.A.T. may not have been appropriate. For many students, a higher or lower level, or a different test might have been preferable.

As in the previous cycle, the program for LEP students met only one of its two objectives. The objective that 30 percent would master at least five skills per 20 sessions was met. The objective that 80 percent would master two skills per 20 sessions attended was not met. The objective attained in 1986-87 was the one not attained in 1985-86. The 1986-87 program was successful for higher-functioning students but failed to achieve its objective at relatively lower levels of performance. Given the small sample of 44 students, the ability to generalize these findings is uncertain.

In math, the achievement objective was attained, as it was in the previous program cycle. Ninety-eight percent of the students receiving instruction mastered at least two new skills, and 56 percent mastered at least five new skills. The majority of the skills students mastered were in the areas of whole number operations and special topics such as money, graphs, tables, time, and Roman numerals.

The conclusions, based upon the findings of this evaluation, lead to the following recommendations:

- ° Offer to classroom teachers (i.e., non-Chapter 1) more in-depth discussion of effective instructional techniques, innovative materials, and the utilization of the word processor as a teaching aid.
- ° Replace the M.A.T. in reading with an individualized criterion referenced test, if possible, for lower-functioning students in reading, i.e., those now categorized at the Primary 1 test level.

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CHAPTER 1/P.S.E.N. REMEDIAL
READING AND MATH
1986-87*

EVALUATION SUMMARY

- The 1986-87 Chapter 1 program was satisfactorily implemented. Teachers and administrators overwhelmingly approved of the services that were provided.
- Eligible English-speaking public and nonpublic school students did not meet the program objective in reading. Nevertheless, program students showed larger gains in reading performance this year than last year.
- Limited English-proficient (LEP) students met one part of the dual-criterion program objective in reading.
- Eligible students met and exceeded the program objectives in math.

The Division of Special Education Chapter 1/P.S.E.N. Remedial Reading and Mathematics Program was designed to provide remedial instruction in reading and/or math to eligible students in self-contained special education classes in public and nonpublic schools that supplemented their regular instruction. A secondary goal was to provide pre- and inservice training to special education teachers. The program served a total of 4,910 students. Four thousand three hundred and fifteen received instruction only in reading; 44 of these received reading instruction in Spanish. Another 416 received instruction in both reading and math, and 179 received only math instruction.

To measure academic progress, students who received remedial instruction in reading were pre- and posttested with the Metropolitan Achievement Test (M.A.T.). LEP students participated in the Leamos Spanish Development Reading Program (Leamos) which assessed achievement on an ongoing basis. In mathematics, the Individualized Criterion Referenced Test (I.C.R.T.) in math provided achievement data, also on an ongoing basis.

*This summary is based on "A Final Evaluation of the Chapter 1/P.S.E.N. Remedial Reading and Math Program 1986-87" prepared by the O.E.A. Special Education Evaluation Unit.

EVALUATION • R & D • TESTING • DATA ANALYSIS

The Office of Educational Assessment (O.E.A.) conducted an evaluation of program implementation and analyzed achievement data reported by the program. The evaluation of program implementation consisted of observation of the program at representative sites, as well as interviews with program staff; staff also filled in staff-development assessment forms. Analysis of these data indicated that the program was adequately implemented. The remediation consisted of individualized diagnostic-prescriptive instruction. Reading instruction was based on a holistic, meaning-centered approach; mathematics instruction emphasized word problems and practical skills. Consultants observed a holistic approach to reading instruction at 90 percent of the sites visited. For students receiving instruction in both reading and mathematics, field consultants observed the integration of reading and math instruction through the use of word problems and vocabulary study.

Program staff and special education teachers received pre-service orientation in the fall and inservice staff development during monthly workshops held in each region, and on-site consultations with program staff. They rated their orientation and inservice training favorably. Because of a cutback in funding in 1986-87, substantially fewer special education classroom teachers reported receiving inservice training than in 1985-86. For future cycles, teachers requested more training in the use of new materials, the application of innovative instructional techniques, and the utilization of the word processor as a teaching aid. They also requested more on-site workshops and more individualized training.

The student achievement objective for reading in English was that 75 percent of the students would demonstrate at least a one-point normal curve equivalent (N.C.E.) gain in reading comprehension from pretest to posttest on the Metropolitan Achievement Test (M.A.T.). Of the 3,255 students for whom achievement data were complete, 59.9 percent attained this goal. The average gain was 3.9 points (S.D.=12.2). Although this was an improvement over the previous year's performance, the objective was not attained. Excluding the Primary 1 and elementary test levels, students at Primary 2, Intermediate, and Advanced levels did meet the objective. Students at the Primary 1 level showed a statistically significant mean N.C.E. loss on pre- and posttest scores on the M.A.T., suggesting the M.A.T. was not sufficiently sensitive in measuring the performance of lower-functioning students.

A total of 44 students in bilingual classes were taught reading in Spanish. The program objectives were that 80 percent of these students would master at least two new skills per 20 sessions attended, and that 30 percent would master at least five new skills per 20 sessions attended. Of the total number of students, only 54.5 percent mastered at least two skills, while

34.1 percent mastered at least five skills. Thus, the objective was only partially met.

The program objectives for math were that 80 percent of the students would master new math skills at the rate of two per 20 sessions attended, and 30 percent would master five or more new math skills per 20 sessions attended. Both objectives were met in that 98 percent mastered two skills per 20 sessions and 56 percent mastered at least five skills per 20 sessions attended.

Recommendations for the next program cycle are:

- Offer to classroom teachers (i.e., non-Chapter 1) more in-depth discussion of effective instructional techniques, innovative materials, and the utilization of the word processor as a teaching aid.
- Replace the M.A.T. in reading with an individualized criterion referenced test, if possible, for lower-functioning students in reading, i.e., those now categorized at the Primary 1 test level.